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Green gilled Toadstool introduced from North America.
Photographed in the editor's garden in Inglewood in March 2015.
Photo: Marie-Luise Francis

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JAMES POLLARD – WESTERN AUSTRALIA'S FIRST FREELANCE NATURE WRITER – WITH PARTICULAR REFERENCE TO HIS NOM DE PLUME 'MOPOKE'

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ABSTRACT

James Theodore Harvey Pollard was a journalist, radio broadcaster, literary critic, author of a number of works of fiction and was one of a group of keen naturalists who pioneered the Western Australian Naturalists' Club in 1924. The contributions of most of James Pollard's contemporaries to Western Australia's early natural history knowledge are generally well documented, but his contribution to an understanding and appreciation of Western Australia's flora and fauna, through various magazines and newspapers, has, until recently, been virtually ignored. His response to readers' questions for 15 years between 1923 and 1937 in his interactive nature column in *The West Australian* under the *nom de plume* 'Mo'Poke' (from 1934 modified to 'Mopoke') was an important source of information for many readers. The more important observations provided to Pollard by his readers are reviewed here. Some of Pollard's own observations are also included.

INTRODUCTION

James Theodore Harvey Pollard was born in 1900 in Yorkshire, England and migrated to Western Australia with his family at the age of 14. At first he helped his father clear a block of land near Mt. Barker, then worked at nearby 'Warburgh' run by the Warburton brothers. His experiences with bushmen there and later at Calingiri in the wheatbelt, where he had taken up land under the soldier settler

scheme, led to a series of 'Bushland' novels and short stories which appeared between 1926 and 1948. According to the Oxford Companion to Australian Literature they are "distinguished more by their incidental naturalist descriptions than by any literary features".

The first World War had already started by the time Pollard joined his father on another farm in the northern wheatbelt. At the age of 16 he joined the AIF, was severely wounded at the battle of Passchendaele in 1917 and discharged in May 1918. Repatriated home, he convalesced in Fremantle Hospital before taking up land through the Soldiers' Settlement Scheme at Calingiri. He abandoned farming at Calingiri in 1925.

It was in 1923, while in Calingiri, that he commenced a nature column called *Denizens of the Bush* for *The West Australian* using the *nom de plume* 'Mo'Poke'. He joined the Western Australian Naturalists' Club in 1924. His nomination (by D.L. Serventy and L. Glauert) and membership were approved at the Club's second meeting on 29 August (Battye Library MN742 2846A/93). In 1927 he moved to Perth and on his marriage to Florence Miles in 1928 he built a home in Canning Road Kalamunda. During the Second World War he served as a W.O.2 in an engineering unit. After the war he was very active in encouraging children's interests in natural history, especially through

An undated photo of a youthful James Pollard possibly taken in England shortly before leaving for Australia.

the development of children's libraries. In the latter years of his life he lived in Cottesloe.

Most, if not all of Pollard's contemporaries, especially those involved in the formative years of the Western Australian Naturalists' Club, have been acknowledged for their contributions to natural history. Until recently, details of James Pollard's life were scattered, with no substantial biographies or obituaries. (Hughes-d'Aeth 2011) assesses the career and life of James Pollard "in order to examine the environmental sensibility of Western Australia", particularly in the interwar years. It is the intention of this paper to analyse Pollard's column 'Mopoke' for original content dealing with the distribution, status and behaviour of terrestrial vertebrates (in all but one case South-west Western Australian species).

Pollard's involvement in the formative years of Perth's writing fraternity and his knowledge of natural history, together with his access to a coterie of local biologists such as L. Glauert (Museum Director), L. J. Newman (Government Entomologist), W. M.Carne (botanist, Agriculture Department) and later C.A Gardner (Government Botanist) placed Pollard in a unique position. He had knowledge, communication skills and contacts – he was the perfect conduit for the dissemination of natural history knowledge for the times.

From time to time in 'Mopoke' he augmented readers' observations with his own: he contributed notes from Mongers Lake in Leederville where he lived for a short time, from Kalamunda where he lived for many years, from Nornalup in 1927 (when he joined the RAOU campout in quest of the Noisy Scrub-bird) and from a sojourn on the upper Murchison in 1933.

Towards the end of his first novel *The Bushland Man* (Pollard 1926) Pete Rodon, Pollard's protagonist bushman and amateur collector, becomes disenchanted with collecting and the pursuit of natural history thus:

"Somehow it seems a very grave wrong to me that so many men the world over should wage ceaseless war on Nature's folk. Once a fact is established Science needs no more knowledge about it but the professors...and a lot of other misguided followers of Dame Nature are today establishing the same facts over and over again...and there will be more...wasteful work..." (Pollard *loc. cit.* p.293).

Pollard, the man, reinforces this opinion in 'Mopoke' (20/10/28) when answering C. F. H. Jenkins' question about the number of magpie species in Western Australia. Jenkins had a collector's licence and inferred the solution to the problem could be solved by collecting specimens. Pollard countered "the number of species won't make much difference to me

since they all give the same glorious carol." and further on "I have always held that scientific collecting is overdone..."

We searched the W.A Museum vertebrate data bases and found no records of specimens donated by Pollard. Furthermore, we are informed (B. Hanich *in lit.* 7/10/14) just four spiders and four scorpions were donated to the WA Museum by Pollard which re-enforces the impression that he was more interested in communicating rather than collecting. Although he sanctioned invertebrate collecting (he regularly gave advice on specimen preparation) there is a strong sense that he was adverse to vertebrate collecting. Perhaps he was considered a journalist-novelist, a reverential observer — an advocate rather than an inquisitor of nature? Maybe this viewpoint set him apart from his peers, resulting in the ultimate neglect of his achievements? After all, in 'Mopoke' he was largely filtering and responding to information sent to him.

By 1938 Pollard had acquired status in Perth's writing community and he was one of the first writers invited by John K. Ewers to attend early discussions on the establishment of the Western Australian branch of The Fellowship of Australian Writers (FAWWA). He took the role of Senior Vice-President at the first Executive Committee meeting and followed John K. Ewers into the Chair, serving as President from 1939 to 1940.

By 1949 Pollard was no longer a financial member of the Western Australian Naturalists' Club (*Western Australian Naturalist* **1**: iv) and probably no longer actively engaged in natural history pursuits. It seems that, apart from writing contributions for the Education Department's rural school magazine, his involvement and interest had waned. It is odd that, having spent the previous 30 years writing about nature, Pollard had no wish to take the opportunity of publishing original work in the *Western Australian Naturalist* journal between its inception and the remainder of his life.

Western Australia has a proud history of writer-naturalists popularising natural history. A number of early Western Australian naturalists used *nom de plumes* to promote nature (Erickson 1964). Glauert, of the WA Museum, was probably best known for his popular nature writing because he wrote under his own name and from an authoritative position in the public service. In an unassuming way Pollard was also prominent, not only for the longevity of 'Mopoke' but also for the many articles published under his own name. As time went by, his ability to utilise radio to spread his message, through scripts such as 'In the haunt of the Gnowa' and 'With the Magpie family' (see Battye Library MN742 2846A/143 and 144 respectively) increased his influence. He described

An undated photo of James Pollard possibly taken in 1928 at his wedding.

himself as a journalist in the 1931 State Electoral Role for the Division of Swan. In many ways Pollard was Western Australia's first freelance nature writer.

J. K. Ewers (1904–1978) the novelist and educator, was a keen entomologist and early contributor to Pollard's 'Mopoke' under the pen-name 'Dominie'. Their mutual interests of story telling and nature led to their life-long friendship (T. Kotai-Ewers pers. comm.).

Vincent Serventy was president of FAAWA from 1957–1959 and 1963–65, although he left for Sydney midway through his second term to better engage in his teaching and environmental pursuits. His activities greatly influenced children, politicians and business men.

Arachnologist Barbara York Main (1967) combined her scientific knowledge and reminiscences of growing up in the WA wheatbelt to write a classic piece of landscape writing. In many ways it is a precursor to much of the nature ecowriting so popular today.

More recently W.H. Butler, professional collector and conservator, has used all forms of the media to broadcast the conservation message.

'MOPOKE'S' CONTENT AND STYLE

'Denizens of The Bush' by *'Mopoke'* ran for over 600 weeks in the Saturday *'West'* from 14 July 1923 to 17 April 1937 with few lapses. Not surprisingly, there were changes. On 1 September 1934 Mo'Poke was amended to 'Mopoke'. Early columns were generally between 1400 and 1700 words. By early 1930, the length of the column contracted by a third to a half, to rarely more than 1000 words. The shortest column was 303 words (29 February 1935) and the longest 1857 words (29 August 1925).

Photographs were introduced in the latter life of *'Denizens'* which, together with the new found brevity, brought it more in line with the style of Glauert's concurrent weekly column *'The Naturalist'* in the *Western Mail* (1928–30).

Most of the letters to the column deal with birds, mammals, insects and spiders. Fewer deal with reptiles (mostly snakes), frogs, plants and fishes, while there are some interesting notes on aboriginal animal names, some harking back to the nineteenth century. Sometimes Pollard advertised WA Naturalist Club events. On 15 November 1924 he advertised the meeting date for the first Naturalists' Club meeting and soon afterwards (20/12/24), what must have been the club's first excursion to – John Forrest National Park.

The subject matter of Pollard's contributors varied. Many were simple enquiries accompanying a specimen, wanting to know its identity. There were regular contributors like Bruce Leake, a founding member of the W. A. Naturalists' Club. He provided concise notes from the Kellerberrin area. Nurse Hewitt was an astute observer who sent notes from Narrogin over several years. Others reminisced about the status of the Western Australian fauna as far back as the 1860's.

On 10 March 1928, C.F.H.J[enkins] of Northam wrote wanting to know what qualifications were required to join the R.A.O.U and where he could obtain entomological pins. 'Mopoke' suggested he send him a stamped addressed envelope for the pins. Generosity such as this can turn history – Jenkins eventually became Government Entomologist. On 16/12/24 Pollard flagged a request from L. Glauert for scorpion specimens for the WA Museum. On another occasion (19/6/26) he discusses the pelage of a possum (by comparing it with Museum collection skins) forwarded to him from Brookton. This exchange of information and donation of correspondents' specimens to public institutions was important, especially to the indigent Western Australian Museum.

On 27 April 1929, under the heading Problems for Correspondents, Pollard wrote " It is my lot to have to answer so many questions – which I enjoy doing..." He then goes on to criticise writers for the shallowness of their questions and gives examples of what he would consider better ones. Despite his protestations there are good data embedded in 'Mopoke's' columns.

Hughes-d'Aeth (*loc. cit.*) describes Pollard's writing as avuncular. His writing was certainly avuncular, but it varied depending on whom he was addressing. Sometimes he cajoled. On 26 January 1924, Mr Clarke the Assistant Government Entomologist, advised Pollard on the weather instincts of ants. As a postscript to the published answer, Pollard posed a question about the dietary habits of ants. "Well now mates o' mine, here's a nice controversial subject to hand for us to worry over and I hope that neither side will be lacking in followers." This "hail fellow well met" persona was a

conscious attempt to identify with, and engage the readers, in a way he thought they would react and offer information. On 29/9/28 he admonishes a correspondent: "Your specimen had a disturbing smell and the packages were consigned to the incinerator unopened." Pollard was also reflective, engaging in personal lyric monologues from time to time. There is a sense that these segments are written as much for himself as his readers. On one trip to the South-west (7 January 1933) he wrote: "A golden-breasted whistler and his mate gave us music where we boiled the billy along the Blackwood River, and oft times the golden birds came close within view. And a pair of scarlet robins kept them company. Southward through the heavy jarrah and karri forest into Manjimup wild life was seldom seen and heard, and one grew to wonder that such a wealth of timber verdant, growing, virile, could be so silent and – so still. Northward — through Bridgetown, Boyup Brook, Dinninup and into Williams, thence to Narrogin — and on through that peaceful old-world rural country that is charmingly named Wandering, many bird friends gave us greeting. Among them bronzewing pigeons clapped into flight from the forest floor and a flock of black cockatoos wheeled down from the timbertops, whilst the commoner birds included twenty-eight, pipit, magpie, squeaker and crow. Also, nearing Williams a kangaroo doe and her joey briefly shared the road with us, presently giving us room to pass between them and to leave them in peace".

The last passage is in keeping with T. Kotai-Ewers' (pers. com.) recollections of Pollard "He was a gentle, quietly spoken man".

DETAILED REFERENCES TO 'MOPOKE'

Hughes-d'Aeth (*loc. cit.*) describes the contributions to 'Mopoke' as "popular nature study". We have extracted notes from all of 'Mopoke's' columns. Most of the casual observations received were concurrent with the life of 'Mopoke'. Some were decades old, even then, and have even greater interest and value now. A lot of the data have been surpassed by current knowledge, but there is a hard core of useful information, especially that pertaining to the distribution status and behaviour of (now) endangered species (See Wildlife Conservation Specially Protected Fauna Notice 2013, schedule of fauna likely to become extinct, Govt Gazette, WA 17 September 2013).

Also included are first sightings (range extensions) of feral species. Although not important in the light of current knowledge, the immediacy of the reports exemplify the day-to-day awareness of the natural world that permeated the life of Pollard's readers.

Under "miscellaneous" there are reports which improve our knowledge of some species.

The contents of some particularly informative letters are included, as are comments on certain Nyoongar animal names.

DISTRIBUTION STATUS AND BEHAVIOUR OF MAMMALS

Endangered species

Bilby, Dalgyte, (*Macrotis lagotis*): 24/5/24 p.13; 11/4/25 p.9; 16/5/25/25 p.13; 11/7/25 p.15; 25/7/25 p.15; 1/8/25 p.15; 5/9/25 p.11; 12/9/25 p.15; 19/9/25 p.11; 3/10/25 p.15; 10/10/25 p.15; 31/10/25 p.15; 14/11/25 p.15; 12/12/24 p.15; 16/1/26 p.13; 30/1/26 p.13; 24/12/27 p.5; 21/4/28 p.5; 5/5/28 p.5; 17/11/28 p.5; 25/5/29 p.6; 15/6/29 p.6; 23/11/29 p.5.

Chuditch (*Dasyurus geoffroii*)

20/10/23 p.13; 26/1/24 p.11; 9/2/24 p.11; 20/7/24 p.11; 25/7/25 p.15; 5/9/25 p.11; 12/9/25 p.15; 31/7/26 p.9; 24/12/27 p.5; 10/11/28 p.5; 28/11/31 p.4; 5/1/35 p.4; 11/7/36 p.6; 12/12/36 p.6.

Other Dasyurids

12/9/25 p.15; 14/5/27 p.7; 3/3/28 p.6; 8/2/36 p.4.

Numbat (*Myrmecobius fasciatus*)

14/11/25 p.15; 26/3/27 p.9; 9/4/27 p.8; 4/8/28 p.5; 29/9/28 p.5; 9/2/29 p.6; 23/3/29 p.6; 11/6/32 p.4; 8/4/33.p.4; 4/4/36 p.4; 2/5/36 p.6; 16/5/36 p.6; 6/6/36 p.4; 17/10/36 p.4.

"Ginnungin" (16/5/36) says that from 1872 to 1878 he lived between Beverley and Kellerberrin, when Numbats were plentiful in that area. He writes:" I have seen hundreds of them; have caught at the very least 150; and once made a cloak of 50 odd skins, but they were not tanned and the fur soon came off." He also gives one spelling of the aboriginal name as Noumbat. From his observations, he says that the animals "ran on all fours about the same as a cat, but do some jumping around when in playful mood." They often sit erect, he notices, and "they burrow in the ground and they have young, which they keep under cover until they are able to run about; then they bring them out, taking them in at nightfall. When they are able to fend for themselves they are abandoned by the mother." He adds that he has seen as many as five in one litter; and he is afraid foxes will destroy them – "unless the fox objects to the smell, which the yuckine (dingo) and the domestic dog do not like."

Ginnungin's observations on the burrowing habits of the Numbat predate those of Christensen (1975) by almost exactly 100 years and although the numbers he quotes may seem excessive they are consistent with those of Best (Jenkins 1974).

Nail-tailed Wallaby (*Onychogale lunata*) Warrine, Warrung

6/6/25 p.11; 25/7/25 p.15; 22/8/25 p.13; 29/12/28 p.5.

Banded Hare Wallaby (*Lagostrophus fasciatus albipilis*) Mernine, Munning.

16/5/36 p.6.

Rufous Hare-wallaby (*Lagorchestes h. hirsutus*) Warrup.

16/5/36 p.6. Again, Pollard quotes "Ginnungin" (this time from Koorda) who offers valuable insights into the status of the Numbat, Wurrup and Mernine there. "Numbat by no means very rare, not nearly so rare as the Warrup and Mernine "which he fears are "both extinct".

Tammar (*Macropus eugenii*) Dama, Bonnin

14/11/25 p.15. 23/2/29 p.6.

Kangaroo Rats (*Bettongia* sp. and *Potorous*)

There are a number of references to the Boodie (*Bettongia lesueur*) and the Woylie (*Bettongia penicillata*) and far fewer to Poteroos. Pollard and his readers often discuss them concurrently under "Kangaroo rats". Although it is usually clear which species is being discussed, all are listed here under "kangaroo rats".

16/5/25 p.13; 30/5/25 p.11; 12/12/25 p.15; 2/1/26 p.9; 5/11/27 p.7; 24/12/27 p.5; 7/1/28 p.8; 3/11/28 p.5; 1/12/28 p.5; 15/12/28 p.5; 19/1/29 p.6; 26/1/29 p.6; 11/9/26 p.9; 9/2/29 p.6; 3/8/29 p.5; 3/8/35 p.6.

"Ariel" (3/8/35) of Hines Hill says "the Boodie was once a pest at Hines Hill is now gone".

Feral species

Fox (*Vulpes vulpes*)

24/11/23 p.13; 20/9/24 p.9; 6/9/30 p.4; 20/9/30 p.4; 3/6/33 p.4; 6/6/36 p.4; 15/8/36 p.4.

DISTRIBUTION STATUS AND BEHAVIOUR OF BIRDS

Endangered species

Mallee Hen Gnow, Gnowa (*Leipoa ocellata*)

27/10/23 p.13; 6/9/24 p.11; 20/9/24 p.9; 27/9/24 p.13; 13/12/24 p.11; 14/11/25 p.15; 28/1125 p.11; 30/4/27 p.9; 10/12/27 p.6; 17/12/26 p.6; 24/12/27 p.5; 7/1/28 p.8; 21/1/28 p.6; 23/1/32 p.4; 29/7/23 p.4; 6/10/34 p.4; 23/3/35 p.6; 13/4/35 p.4; 27/7/35 p.6; 7/9/35 p.6; 22/2/36 p.4.

"Black Cockatoos" (*Calyptorhynchus* spp.)

There are a number of references to "Black Cockatoos" in Pollard's column but they are rarely identifiable as *C. baudini*, *C. latirostris* or *C. banksii naso*. The exceptions are:

Baudin's Cockatoo (*C. baudini*)

12/10/35 p.4.

Carnaby's Cockatoo (*C. latirostris*)

8/3/24 p.11; 12/10/35 p.4.

Red-tailed Black Cockatoo (*C. banksii naso*)

12/10/35 p.4.

Feral species

Kookaburra (*Dacelo gigas*)

27/6/25 p.11; 8/10/27 p.11; 21/12/29 p.4; 20/9/30 p.4; 28/11/31 p.4; 1/7/33 p.4; 29/7/33 p.4; 12/8/33 p.4; 19/8/33 p.4; 16/9/33 p.4; 29/6/34 p.4; 16/11/35 p.4.

Miscellaneous

19/4/24 p.5. JJB reports a 13'6"

(about 4.1cm) Carpet Snake collected in Mt Lawley, then called Big Hill, about 65 years ago (i.e. about 1860).This far exceeds the maximum size quoted by Storr, Smith and Johnstone (2002). The skin hung in the Swan River Mechanics' Institute which was the Swan River Colony's first cultural centre. In time it was to house an extensive and well-used subscription library and a natural history collection including botanical, zoological and mineral specimens.

31/3/28 p.6 W.E. Robinson reports a 20' snake [*Liasis olivaceous barroni*] on Croydon Station and notes their habits.

30/11/29 Pollard records a Death Adder (*Acanthophis antarcticus*) from Kalamunda. Records from this part of the Darling Range are very rare.

On 12/7/24 Hugh Christie at Cape Don, NT wrote " Certain [Mudlarks] seem to return to the same locality... in 1899 one of my comrades shot one in the foot, which caused the limb to cramp up. In 1921 the bird was still coming to the same region." Hugh Christie was a keen naturalist who worked for the Commonwealth Lighthouse Service for 47 years, more than half of that time in the Northern Territory, and was considered a competent observer.

It is established that Mudlarks are at least partial migrants. In the Northern Territory they vacate the north coast in the wet season from November to April (Storr 1966). This annual return of a particular Mudlark to a precise locality is a rare, early observation that indicates their migration may not be as haphazard as believed.

NYOONGAR ANIMAL NAMES

The following are notes on Nyoongar names. Most are not included in Bindon and Chadwick (2011).

Bindon and Chadwick (*loc.cit.*) give the wild dog's name as Yuckine and five Noongar names for the Dingo, one of them dorder yockine and another dwert. According to a correspondent from Lomos (18/4/36 p.4) "the Bibbulmun people call the red dog Yuckin and the black dog Dwert. As the white man's dogs they first saw were mostly dark they called them Dwert. Eventually they called all dogs Dwert when speaking to white people but red dogs were always Yukin among themselves".

Pollard notes (26/3/27 p.6) of a Mr W. Ward that "over 65 years he has only ever heard the Numbat referred to as the Knumbat". Pollard admits not knowing that variation, but refers to Aflalo (1896) who records the natives around Perth referring to the Numbat as the Yelkie.

Not surprisingly, Bindon and Chadwick (*loc. cit.*) list many names for snakes, some of them

specific, but they do not mention Gwand-ah or Gward-ah for *Pseudonaja nuchalis*. Glauert (WA Museum) reserved these names for the banded form of *P. nuchalis* (4/12/26 p.9) and it was not until much later that the variation Gwardar was settled on for all Western Australian colour variations of *P. nuchalis*.

Womwilla is the native name for lerps (scale insects) in the Beverley district (30/4/32 p.4).

Nam jeela is the name of the Squeaker (*Strepera versicolor*). (13/11/29 p.9.)

Babbin is the name of the Black-capped Sittella (*Neositta pileata*) (31/3/28 p.6.).

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NOTES ON THE DISTRIBUTION AND CONSERVATION STATUS OF THE PERTH LINED SKINK, *LERISTA LINEATA*: A SMALL LIZARD IN A BIG CITY

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ABSTRACT

The fossorial skink *Lerista lineata* is largely restricted to the Swan Coastal Plain where its distribution is centred on the highly disturbed southern Perth metropolitan area. As a consequence, much of this species' former habitat has disappeared. As most of its current distribution is in suburban gardens and remnant bushlands that are subject to weed infestation, frequent fires, and further fragmentation and introduced predators, the long-term survival of *L. lineata* is tenuous at best. Here we present a review of the available distributional information and recommend an urgent re-evaluation of its conservation status. We also comment on the adequacy or otherwise of such listings with regard to their efficacy in improving the conservation status of small fossorial reptiles.

INTRODUCTION

The genus *Lerista* is the second-most diverse Australian skink group with currently 91 described species (Wilson and Swan 2013). As a consequence of their morphological diversity displaying the complete range of progressive loss of limbs and digits, combined with local species richness, they provide an ideal group to study speciation, comparative ecology and evolutionary relationships (Greer 1989; Kendrick 1991; Skinner *et al.* 2008; Skinner and Lee 2009). In such a diverse group, some species are widespread throughout arid sandy areas (e.g. *L. bipes* and *L. desertorum*); however, many have very restricted distributions, resulting in various listings based on conservation status by various authorities throughout Australia. For example, in Queensland, half of the 19 recorded species are listed as rare, vulnerable or endangered (Wilson 2005; Wilson and Swan 2013). Indeed, one species, *L. allanae* was presumed extinct (Covacevich *et al.* 1996) until a

series of targeted surveys resulted in its rediscovery (Borsboom *et al.* 2010). *Lerista allanae* is currently listed as endangered under both the *Environment Protection and Biodiversity Conservation Act 1999* and the *Queensland Nature Conservation Act 1992*, demonstrating that even small reptiles can be severely impacted by long-term threats of habitat removal associated with clearing (Amey *et al.* 2005).

In Western Australia, the genus *Lerista* is particularly rich with 67 described species (Western Australian Museum 2014), including two conservation significant species listed as vulnerable. *Lerista praefrontalis* is known only from a single specimen collected from an offshore Kimberley island and is of dubious taxonomic status (Maryan and Robinson 1997; Aplin and Smith 2001). The other conservation significant species, *L. nevinae*, is known from the Pilbara coast between Point Samson and Cape Lambert (Smith and Adams 2007), a small area subjected to potential mining infrastructure and other disturbances, requiring survey by consultancy companies to document local distribution, habitat preferences and relative abundance (e.g. Biota 2008).

Another 16 *Lerista* species are variously ranked as Priority species mainly due to their restricted distributions. Criteria for listings state these taxa are in need of urgent survey work so that their conservation status can be evaluated (Bush *et al.* 2010). However, evaluation is not happening, which questions the listings in the first place, if the various threatening processes are not considered and prioritised to address the criteria (Maryan *et al.* 2013). For example, one species, *L. quadrivincula*, is known from a single holotype specimen collected decades ago and is afforded a Priority One ranking. Despite the criteria stating for this species urgent survey is required to evaluate conservation status, we are not aware of any research priorities to investigate this species. Based on available specimens of one individual, *L. quadrivincula* qualifies as one of Australia's rarest vertebrates and could possibly be extinct.

Special protection of declared threatened fauna is provided under the *Wildlife Conservation Act 1950*, at the discretion of the Minister for the Environment. One species of particular interest and conservation significance, *L. lineata*, was formerly recognised as having threatened species status until being removed from the list in 1990. Currently, this species is afforded a Priority Three ranking which states 'taxa with several, poorly known populations, some on conservation lands'. We believe a re-evaluation of this species' conservation status is required because of its restricted distribution within one of the fastest-growing cities in the world.

Here we present a review of available literature on *L. lineata*

distribution, demonstrating the extent of habitat loss based on historical records throughout the Perth metropolitan area and comment on remaining populations in the few conservation lands and other non-protected areas. We also discuss the insular and outlier populations requiring further investigation and provide an updated summary on its current conservation status in light of this additional information.

OVERVIEW OF *LERISTA LINEATA*

Lerista lineata was described by Bell (1833) representing the type *Lerista* and according to Cogger *et. al.* (1983), the whereabouts of the holotype remain unknown, which may need to be addressed at some stage with the designation of a neotype. The species was subsequently redescribed by Storr (1971) based on 10 available specimens from the vicinity of Fremantle, including Garden and Rottnest Islands.

Lerista lineata is a small, slender fossorial species with 2 fingers, 3 toes, immovable eyelids and brownish or silvery grey body with prominent black paravertebral lines, a broad black upper lateral stripe and narrow pale midlateral stripe (Figure 1). Previous attempts to allocate *L. lineata* into a meaningful species-group based on morphological similarities and genetic data have variously placed this species within its own group (Wilson and Knowles 1988) or the '*L. elegans* group' (Storr *et al.* 1999; Aplin and Smith 2001). However, more recent phylogenetic analysis suggests *L. lineata* and *L. planiventralis* are closely-related and constitute a natural group (Skinner *et al.* 2008). This was first noted by Ehmann (1992) and

Figure 1. Perth Lined Skink *Lerista lineata.*

subsequently used by Bush *et al.* (2007). Ehmann (1992) further states their shared characteristics to be considerably modified in the highly specialised *L. planiventralis*. Therefore, in this case, *L. lineata* represents the more plesiomorphic member of the group with a more restricted and relictual distribution by comparison.

As with many other small species of reptiles in Australia, the basic biology of *L. lineata* is virtually unstudied, therefore inferences on population size, declines or seasonal trends related to breeding and feeding are largely speculative. The limited information available suggests males are in reproductive condition during spring and females collected in November have two to three (typically three) eggs (Ehmann 1992).

The restricted mainland habitat occupied by this species is pale sands (calcareous and siliceous) on coastal plains with *Banksia* and/or *Eucalyptus*, and coastal and low fixed dunes, supporting heathlands and shrublands, providing a well-developed patchy litter ground cover (Wilson and Knowles 1988; Ehmann 1992; Bush *et al.* 2010; Wilson and Swan 2013). This species shelters in the upper layers of loose soil beneath leaf litter, logs, at the base of shrubs, inside bulldozer spoil heaps alongside firebreaks/tracks, in abandoned stick-ant nests, and occasionally in loose soil beneath discarded rubbish.

DISTRIBUTION

Currently, there are 233 specimens of *L. lineata* held at the Western Australian Museum allowing us to provide a review of its current distribution. The most current distributional account is provided by Bush *et al.* (2010) stating this species is locally restricted to the Swan Coastal Plain south of the Swan River including Garden and Rottnest Islands, extending south to Binningup (near Bunbury), with a single, old record from Busselton, and only recorded for the first time during the mid-1990s north of the Swan River on Woodleigh Station just east of Shark Bay.

Perth Metropolitan Area

The majority of *L. lineata* records are from the southern suburbs of the Perth metropolitan area (Figure 2) on the Bassendean and Spearwood Dune systems, with the most northerly being East Fremantle (R26813–14) and Alfred Cove (R49285) that are immediately adjacent to the south side of the Swan River. The most inland records are from Queens Park (R50039, R50053) and Forrestdale (B. Maryan and G. Gaikhorst, pers. obs.). The species thus occupies a narrow strip approximately 20–25 km inland from the coast. It seems to be absent from areas of the eastern coastal plain at the interface between the Bassendean Dune system and Pinjarra Plain (How and Dell 1994, 2000). There is a single, old record from Perth

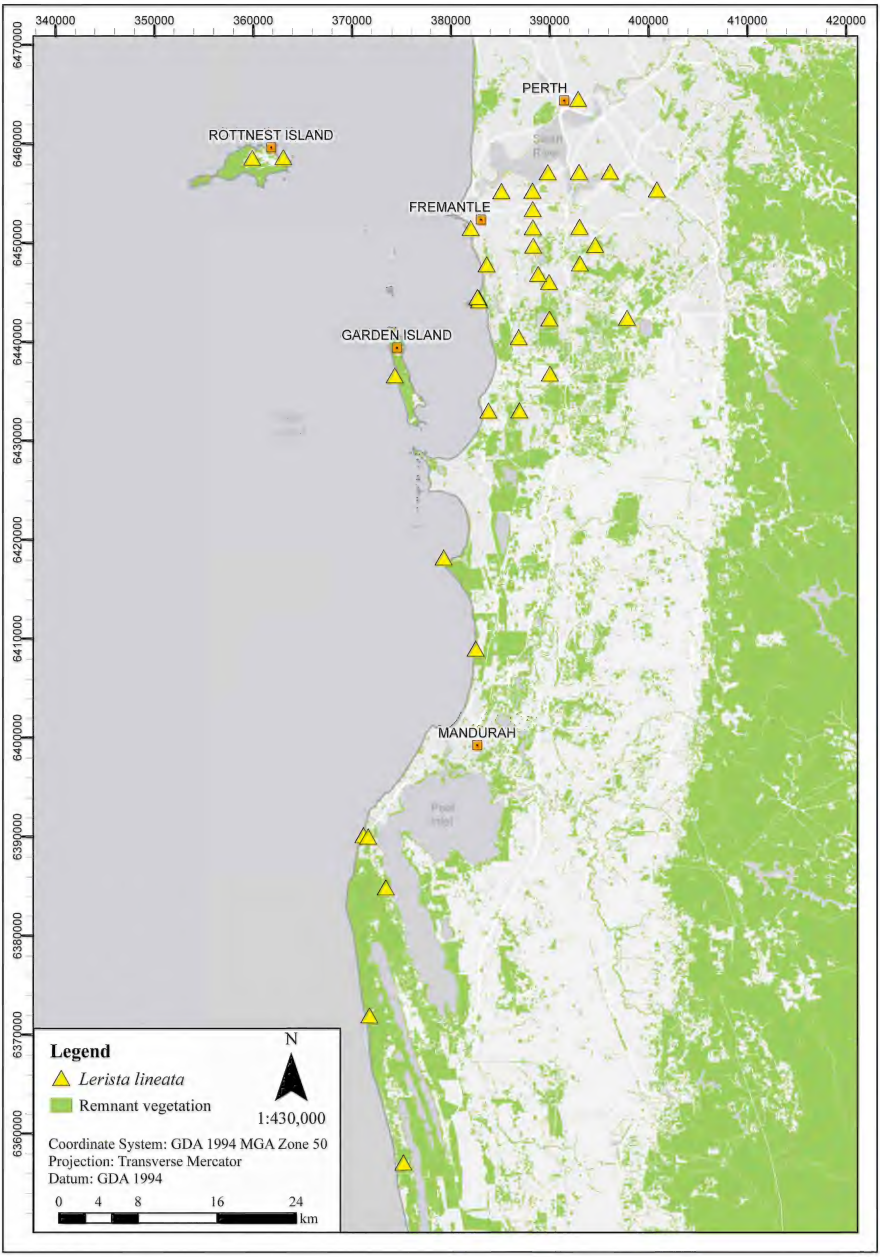

Figure 2. Map of the southern Swan Coastal Plain showing Western Australian Museum records of *L. lineata* and remnant vegetation.

(R8172) which is possibly erroneous considering it is north of the Swan River and no surveys have ever recorded this species in the northern suburbs, including the nearby Kings Park and other reserves (e.g. Storr *et al.* 1978; How and Dell 1994; Berry and Berry 2008).

Based on Western Australian Museum records, fauna surveys and observations, Table 1 presents an historical overview of the locations where this species has been recorded in the southern suburbs of the Perth metropolitan area, and whether any suitable habitat (e.g. conservation lands in hectares = remnant bushlands) exists today with associated references. Other non-protected areas such as suburban gardens and council lands where this species may survive lack the 'security' of a designated conservation land and are not included.

Mandurah to Busselton

Historically, the distribution of *L. lineata* has been documented as extending south only to Mandurah (Storr *et al.* 1981), despite a single, old outlying record from 'West Busselton' (R9621) which was subsequently cited in Storr *et al.* (1999), suggesting the species may extend further south. Unfortunately, this specimen from Busselton (identified by L. Glauert in 1949) was not kept so its true identity cannot be verified.

Recent biological surveys in the area indicate *L. lineata* is present with collection records from Preston Beach (R141425), Melros (R146477: Youngson and Harold 1989), Lake Clifton (R164362–63) and Caddadup Reserve (R166869, R166872). More importantly, these records combined with other observations (Davis and Bamford 2005) show this species occurs in Yalgorup National Park (12,000 ha) and that the Murray River does not act as a geographic barrier. Currently the most southerly confirmed records of *L. lineata* are from Binningup and Kemerton (Metcalf and Bamford 2008; Harewood 2010) just north of Bunbury. Both these locations are approximately 85 km from Busselton, suggesting the southerly extent of this species' known distribution remains uncertain and that further surveys are required. Based on the current records and observations of *L. lineata* between Mandurah and Busselton it appears to occupy a very narrow coastal strip, and is not necessarily continuous in distribution, as indicated by a recent biological survey not recording this species in Yalgorup National Park (How *et al.* 2009).

Garden and Rottnest Islands

The two insular populations of *L. lineata* were documented early with 4 collection records each from Garden (R9230 in 1947; R13026 in 1958; R18538 in 1960 and R28480 in 1967) and Rottnest Islands (R3255–57 in the 1930s and R94517 in 1986);

however, recent biological surveys on the islands appear to demonstrate a contrasting difference in relative abundance, which may be attributed to the degree of habitat disturbance between the two islands. Garden Island (1200 ha) is relatively undisturbed owing to limited access because it is an Australian Naval Base, whereas Rottnest Island (1900 ha) is a tourist destination and has a long history of human disturbance, including farming and the introduction of exotic weeds and pests (Bush *et al.* 2010).

On Garden Island, *L. lineata* has been recorded as scarce, being patchily distributed on the island with 3 observations made from July 1984 to February 1985 (Robinson *et al.* 1987), and 13 observations made from March 1991 to April 1992; these latter observations were made mainly in *Melaleuca* habitats throughout the island (Brooker *et al.* 1995). The intact environment on Garden Island probably represents the best example of a continuous, undisturbed habitat for *L. lineata*, providing an ideal opportunity for comparative population studies between the island and mainland. The lack of disturbance on the island is reflected in the abundance of Carpet Pythons (*Morelia spilota imbricata*) which have all but disappeared on the adjacent mainland due to anthropogenic disturbances (Bush *et al.* 2010).

On Rottnest Island, *L. lineata* has been rarely observed and its status is uncertain. It has only been collected twice on the island since the 1930s and indeed, was documented as "possibly extinct" by Storr (1984). However, individuals were pit-trapped two years later at two sites with a specimen (R94517) lodged at the WA Museum (Burke 1986). A recent biological survey on the island conducted between 2002–07 using pit-traps did not record *L. lineata* (J. Dell, pers. comm.), therefore it has not been recorded from the island for 28 years. Ehmann (1992) presumed that the Rottnest Island population of *L. lineata* was secure; however, the available evidence suggests this may not be so. The level of disturbance and impacts caused by the introduction of exotic pests (e.g. pheasants) is unknown. Further surveys are needed on Rottnest Island to document the distribution, habitat and abundance of *L. lineata*. Similarly, another species, *L. christinae* was also not recorded during recent surveys on the island (J. Dell, pers. comm.).

The case of the skink *Egernia napoleonis* on Rottnest Island is worth mentioning in relation to the introduction of exotic pests. Historically recorded with the last confirmed observation of one killed by a cat in 1959, it is now possibly locally extinct; however, a small population still occurs on one islet off the island coast (Bush *et al.* 2010; J. Dell, pers. comm.).

North of the Swan River

The most intriguing aspect of the

distribution of *L. lineata* is the recording for the first time north of the Swan River in 1994 on Woodleigh Station, east of Shark Bay (McKenzie *et al.* 2000). Three adult individuals (R120836–38) were pit-trapped in limestone uplands with *Acacia grasbyi* scrub on reddish soils, a strikingly different environment to their southern counterparts over 700 km away from Perth. Close examination of these specimens has revealed no significant differences in size, meristics or patterning compared with specimens from south of Perth. It would be useful to know what level of genetic differentiation has been attained for taxonomic research between these widely disjunct populations. This dramatic occurrence of two geographically-distant populations is particularly interesting and not without precedent as shown by the extreme distance of 1400 km between Northern Territory and Queensland populations of *L. karlschmidti* (Couper and Amey 2009).

DISCUSSION & SUGGESTIONS

Currently, *L. lineata* is listed as Priority Three with the following explanation: "Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation before consideration can be given to declaration as threatened fauna" (Department of Parks and Wildlife 2013). The underlying factor regarding the conservation status of *L lineata* is that up until 1990 this species was listed in Western Australia as declared threatened fauna (Bush *et al.* 2010) which has been widely advocated due to habitat destruction (Burbidge and Jenkins 1984; Ehmann and Cogger 1985; Wilson and Knowles 1988; Kennedy 1990; Ehmann 1992; Egerton 1997; Nevill 2005; Davis and Brooker 2008; Bush *et al.* 2010). The only available assessment of the conservation status of *L. lineata* is a 'Rare or Insufficiently Known' listing by Cogger *et al.* (1993) in accordance with variables used to assess and rank Australian reptiles nominated for threatened status based on Millsap *et al.* (1990).

The primary concern with *L. lineata*, notwithstanding we can only speculate on biological information such as population size or trends, reproductive potential for recovery and ecological or reproductive specialisation (Cogger *et al.* 1993), is range size in Australia. Between the Swan River and Mandurah, *L. lineata* has been historically recorded in 32 suburbs in which nearly 50% have no designated areas set aside for the conservation of flora and fauna (Table 1; Figure 2). Therefore we can assume these populations have become locally extinct or they cannot be considered secure if they still persist in suburban

Table 1. Preliminary overview of historical Western Australian Museum records combined with surveys and observations of *L. lineata* in the southern Perth metropolitan area. Sources are based onWestern Australian Museum records (WAM), fauna surveys (SURVEY) and observations (OBS). The surveys and observers are listed in reference column.

SOURCES	LOCATION	NUMBER OF WAM RECORDS	YEAR RECORDED (if known)	CONSERVATION LANDS	REFERENCE
WAM	South Fremantle	1		None	
WAM	East Fremantle	2	1966	None	
WAM	Wilson	3	1972–73	None	
WAM	Manning	3	1972, 1977	None	
WAM	Alfred Cove	1	1975	None	
WAM	Queens Park	2	1975	None	
WAM	Singleton	2	1977	None	
SURVEY	Canning Vale	4	1977–87	None	Maryan (1993)
SURVEY	Jandakot	121	1978–79, 1986	Jandakot Regional Park (2,362 ha)	Davidge (1979); How and Dell (1994)
OBS	"	-	2000-present	"	B. Maryan, G. Gaikhorst, D. Robinson pers. obs.
WAM	The Spectacles	1	1979	The Spectacles Wetlands – Beeliar Regional Park (360 ha)	
WAM	Mandogalup	1	1978	None	
WAM	Beeliar	1	1979	Thomsons Lake Nature Reserve – Beeliar Regional Park (551 ha)	
WAM	Wattleup	1	1981	Harry Waring Marsupial Reserve – Beeliar Regional Park (200 ha)	
WAM	Murdoch	2	1983	None	
WAM	Myaree	7	1983, 1985–87	None	
WAM	Bullcreek	2	1984, 1998	None	
SURVEY	Salter Point	-	1985	Salter Point Reserve (7.5 ha)	Orr (1986)
SURVEY	"	-	1994	Mount Henry (16 ha)	How and Dell (2000)
WAM	North Lake	1	1985	North and Bibra Lake Reserves – Beeliar Regional Park (364 ha)	

SURVEY	"	-	2005	"	Bamford and Wilcox (2005)
SURVEY	"	-	2006	"	GHD (2006)
SURVEY	"	-	2011	"	Phoenix Environmental Sciences (2011)
OBS	Forrestdale	-	2000-present	Forrestdale Lake Nature Reserve (245ha)	G. Gaikhorst pers. obs.
WAM	Yangebup Lake	3	2004	Beeliar Regional Park (103ha)	
SURVEY	"	-	2005	"	Bamford and Wilcox (2005)
WAM	Bibra Lake	2	2003	Cocos Reserve – Beeliar Regional Park (< 1 ha)	
SURVEY	"	-	2003	"	Reynolds, S. (2008)
WAM	Leeming	1	1992	Ken Hurst Park (49 ha)	
SURVEY	"	-	1992	"	Dell and Cooper (1992); How and Dell (1994)
OBS	Woodman Point	-	1985	Woodman Point Regional Park (252 ha)	B. Maryan pers. obs.
SURVEY	"	44	1994–95	"	How and Dell (2000)
OBS	Oakford	-	1997–98	Modong Nature Reserve – Jandakot Regional Park (153 ha)	B. Maryan pers. obs.
OBS	Hamilton Hill	1	1998	Manning Lake Bushland – Beeliar Regional Park (364 ha)	B. Maryan pers. obs.
SURVEY	Jandakot Airport	-	1994	Commonwealth Airport Lands (100 ha)	How and Dell (2000)
WAM	Jandakot Airport	4	2000–01	"	
SURVEY	"	-	2002	"	Bamford et al. (2002)
WAM	Kwinana	1	2001	None	
WAM	Anstey Swamp	2	2001	Rockingham Lakes Regional Park (4,270 ha)	
SURVEY	Port Kennedy	-	1991	Port Kennedy Scientific Park – Rockingham Lakes Regional Park	Maryan and Browne-Cooper (1991)
OBS	North Coogee	-	2009	C Y O'Connor Reserve (29 ha)	G. Gaikhorst pers. obs.
OBS	Orelia	-	2012	None	G. Gaikhorst pers. obs.
OBS	Casuarina	-	2013	None	G. Gaikhorst pers. obs.
SURVEY	Baldivis	-	2013	Baldivis Children's Forest (19 ha)	Maryan (2013)

gardens or other non-protected areas.

Table 1 also shows *L. lineata* is known from 17 areas designated as conservation lands; however these only encompass a meagre total area of approximately 9, 354 hectares that are fragmented and mostly afforded statutory protection due to the presence of important wetland habitats (e.g. Beeliar, Forrestdale and Rockingham Lakes Regional Parks), which are considered unsuitable for fossorial reptiles. The necessary information that provides an evidence of decline for species such as *L. lineata* may never be known. Therefore, conservation status can only be inferred from habitat destruction, which in the case of *L. lineata*, amounts to over 90% of known habitat in the southern Perth metropolitan area being destroyed and unsecure (Figure 2).

Considering the Swan Coastal Plain has the highest human population in Western Australia, and it is predicted that by 2026, 2.2 million people will live in the metropolitan area (Western Australian Planning Commission 2012), the long-term survival of *L. lineata* and other restricted species on the Swan Coastal Plain (e.g. *Neelaps calonotus*: How and Shine 1999; *Ctenotus ora*: Kay and Keogh 2012; *Diplodactylus polyophthalmus*: Doughty and Oliver 2013) requires urgent attention to reflect their current conservation status. We also reiterate based on our own observations and surveys, that even in the large conservation lands (< 1,000 ha) such as Jandakot Regional Park, *L. lineata* is not continuously distributed in all habitats and appear to be patchy in abundance. Habitat fragmentation has a pronounced impact on the persistence of some reptile populations in the winter rainfall areas of Western Australia, such that the greatest diversity of lizard species is associated with larger patches of remnant bushland (Kitchener *et al.* 1980; How and Dell 1994). However, compared to overall loss of habitat, these remnants occupy a very small area and are subjected to pressures from increasing frequency and intensity of fires, weed infestation and increasing cat and fox populations. In addition, further fragmentation is also an issue, as demonstrated by the recent approval to extend the Roe Highway through existing *L. lineata* habitat, therefore reducing its overall range even more.

We believe the current Priority Three listing for *L. lineata* is inappropriate and provide the following suggestions to address some of the important criteria such as urgent survey and evaluation of conservation status for consideration as threatened fauna.

- Southwestern Australia is recognised globally as one of the world's top 25 biodiversity hotspots (Myers *et al.* 2000), and yet in terms of comprehensive biological surveys, the area has received very little

attention and remains poorly documented. In the case of *L. lineata*, targeted survey effort is required to determine southerly distributional limits, focussing on Yalgorup National Park, the only significantly-sized conservation land within its mainland range. Based on current records and observations of *L. lineata* between Mandurah and Busselton the species appears to be patchily distributed and its habitat associations are not known, however this can be addressed with prioritised research. We can only speculate on the minimum amount of information needed to understand the long term conservation security of the now disjunct populations of *L. lineata*. However, a combination of low vagility, presumably high site fidelity and the size-range of remaining habitat remnants, makes *L. lineata* an ideal model species to study the impacts of fragmentation and disturbance. Long term studies on fossorial vertebrates are rare, but very important.

- The relative abundances of the insular populations require investigation with particular attention to Rottnest Island, where *L. lineata* remains unrecorded for over two decades and has been previously documented 'locally extinct'. The perception that 'island populations' are secure is unsubstantiated in this case. An interesting case-study would be to compare population densities between the two islands, Garden and Rottnest, with contrasting histories of disturbance.
- A future molecular analysis of all populations of *L. lineata* is required to fully understand any levels of divergence between the mainland and islands, including the widely disjunct Woodleigh population, which is not afforded any statutory protection on conservation lands. Based on available knowledge, we infer *L. lineata* represents a 'relictual species' by virtue of its anomalous and highly restricted distribution as well as the genetic relationship to the more widespread and highly specialised *L. planiventralis*.
- Up until 1990, *L. lineata* was listed as a vulnerable species and subsequently downgraded, which is perplexing when comparisons are made with other vulnerable listed species (e.g. *Cyclodomorphus branchialis*, *Liopholis kintorei* and *Liasis olivaceus barroni*) with much broader distributions than *L. lineata* (Wilson and Swan 2013). If the West Busselton record is accepted, *L. lineata* occurs from Fremantle to Busselton, a linear distance of 218 km, occupying a narrow strip (albeit fragmented) extending inland to 25 km. Therefore, based on range size in Australia, we suggest *L. lineata* requires reinstatement as a vulnerable species, meet-

ing this category as stipulated by The International Union for the Conservation of Nature (IUCN). This category states 'Included are taxa of which most or all the populations are decreasing because of over-exploitation, extensive destruction of habitat or other environmental disturbance; taxa with populations which have been seriously depleted and whose ultimate security has not yet been assured; and taxa with populations that are still abundant but are under threat from severe adverse factors throughout their range'.

Finally, we suggest a complete detailed assessment of all the current priority and vulnerable listed reptiles in Western Australia. Many of the listings are based on unsubstantiated information reflected in inconsistent criteria between taxa, including species with unresolved taxonomies (e.g. insular populations of *Pseudonaja affinis*) or species only known from single specimens collected decades ago (e.g. *L. quadrivincula*). These lists of threatened species should be reviewed continuously as new knowledge of distribution, ecology, genetic relationships and taxonomy become available. In terms of addressing basic criteria, many of the listed species remain poorly surveyed; therefore any evaluation of conservation status is negated and questions why the listings, particularly the priority species, exist in the first place. For those species such as *L. lineata* where impacts can develop so rapidly, the current system of listing provides no benefit. It is clearly unsatisfactory to continue the current inertia regarding the specific research required urgently to clarify the conservation status of these listed species. The rationale that allows a species to be considered 'secure' because of its existence in conservation lands and on islands is flawed. An overall Australian perspective is provided by Ehmann and Cogger (1985) stating 'the criteria used by both government and non-government conservation agencies in establishing legislation and policies is deficient, and consequently these criteria are often counterproductive and contrary to the long-term conservation prospects of the very fauna for which such organisations have statutory responsibility'.

Clearly for *L. lineata*, a species described 182 years ago; further surveys and ecological studies are recommended. Important information such as extent of occurrence and area of occupancy based on current populations, population size and structure, biology, preferred habitat, threats and threat amelioration is needed (see Borsboom *et al.* 2010). Indeed, there is much work to be done if we are to address the conservation, management and taxonomic issues relating to this small lizard in a big city.

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STATUS OF *TYPHA ORIENTALIS* IN WESTERN AUSTRALIA

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ABSTRACT

A critical review of early herbarium collections, Aboriginal usage and Australia-wide studies strongly indicates that *Typha orientalis* should be considered native to Western Australia.

INTRODUCTION

The family Typhaceae consists of a single genus *Typha* with approximately 10–15 species, that are almost cosmopolitan in distribution. *Typha* species are typically emergent aquatics of fresh water, have wind dispersed seed, and spread by vigorous rhizome expansion once established in suitable habitats. Many species are significant weeds of irrigation channels, and artificial and altered natural wetlands (Varshney 1976 and Parsons and Cuthbertson 2001) throughout their natural ranges. Several species were also major food sources for indigenous peoples worldwide. The genus is taxonomically difficult and it has long been recognised that it is in great need of a world wide revision (Briggs 1987).

Three species of Typha are recorded for Australia: *Typha domingensis* Pers., *Typha latifolia* L. and *Typha orientalis* C. Presl (Briggs 1987). *Typha latifolia* is a European species and is naturalised at a few sites in New South Wales, Victoria and Tasmania. *Typha orientalis* extends from SE Asia through Australia to New Zealand, although it is mainly temperate in distribution being rarely recorded in the tropics. *Typha domingensis* is cosmopolitan in tropical and temperate regions of Australia, Europe, America, Asia and Africa

Typha domingensis and *T. orientalis* are recorded for Western Australia, but *Typha orientalis* is currently listed as an introduced alien (Florabase, 2014). This paper examines evidence indicating

whether this species is a naturalised alien or a native species.

EARLY RECORDS OF TYPHA SPECIES IN AUSTRALIA

Both *Typha orientalis* and *T. domingensis* were collected by Robert Brown during his voyage around Australia in the *Investigator* (Briggs and Johnson 1968). Brown (1810) cited under *T. angustifolia* collections he made from near Port Jackson and Tasmania in 1801. Bentham (1878) was unable to locate Brown's collections, but gave one as Port Jackson based on his localities. Briggs and Johnson (1968) located two of Brown's collections, one of *Typha domingensis* collected in northern Australia at Kew and another of *T. orientalis* in Edinburgh without a locality, but probably in New South Wales (this is the collection given as Port Jackson by Bentham 1878).

In Western Australia, Ludwig Preiss collected *Typha orientalis* below Kings Park in 1839 (In locis paludosis ad radices montis Elizamountain, Perth, 19 Jan. 1839, L. Preiss 1874). This was identified in *Plantae Preissiana* Vol.1, page 3 (Lehmann 1845) as the European species *Typha shuttleworthii* Sond. Et Koch. (*schuttleworthii* in text). Later this collection was determined as differing from European material and described as a separate species, *Typha muelleri* Rohrb. This name is predated by *Typha orientalis* described from the Phillipines.

Preiss comprehensively labelled his specimens and indicated on his collections if he thought the species was an introduced alien; there is no such annotation on the collection. However he did note that the local Aborigines ate the interior of the roots of *Typha orientalis* around Perth (Lehmann 1844–5, page 3).

Typha domingensis was not collected in Western Australia till much later, by a Melbourne collection (Mueller F. s.n. from the Chapman Valley in 1877). This is the oldest Western Australian collection seen of this species. However, Bentham (1878) cites a *Typha* collection from Murchison River by Oldfield in ?1858/9, which may be this species.

On the basis of these records both species were collected in Australia just after European settlement and *Typha orientalis* shortly after settlement in Western Australia.

ABORIGINAL USAGE OF *TYPHA* IN WESTERN AUSTRALIA

Moore (1886) in his diaries, written soon after settlement, made notes on several occaisions on Aboriginal use of *Typha* tubers.

April 2, 1834 (page 220)

"Got from the natives a piece of bread made from the root of the flag which they call yand-yett. It tastes like a cake of oatmeal. They peel the root, roast and pound it and bake it. The root is

as thick as your finger and a foot long."

May 29 1834

"They are busy digging the roots of a broad sort of flag which grows in a swamp near this; some people say this makes sago, or rather arrowroot. I must examine. It is tasteless to me, being fibrous and farinaceous."

Drummond (1836) confirmed that this plant was a *Typha*, noting that

"The cat's tail or reed mace-the plant described by Mr. Moore as a sort of flag or sedge, – grows in abundance in the bed of the stream. This plant is one of great importance to the natives, as furnishing a great portion of the food of their women and children for several months of the year; it is described with a mark of doubt in Brown New Holland Plants as *Typha angustifolia* of Linnaeus, but it is a very different species; the roots in particular are different: they are thick and succulent and contain a large portion of starch and mucilage."

Drummond (1842) further noted that *Typha ?angustifolia* of Mr Brown (all *Typha* species were considered as one by all early botanists, including Brown, 1810, who listed them as *T. angustifolia*).

"This plant is an important one to the natives as it furnishes them, at one season of the year, with a large portion of their food. When the white man first settled in this colony the natives of the Canning, upper Swan, lower Swan and Perth districts were in the habit of meeting annually in the autumn in the vicinity of a swamp on Grove farm, now the property of Mr John Hanley. These meetings lasted for several days and I observed that on these occasions they principally fed upon the roots of the *Typha* which they called yandayit. They strip off the outer covering of the long creeping roots reserving the pith which contains a large quantity of starch. They generally cut the roots into convenient lengths and roast them in the ashes and chew them whole spitting out the fibrous parts, but sometimes they split the roots collect the starch in their cloaks and bake into cakes. The plant is abundant in most of our lakes and rivers, but it is only in the autumn months, when the plant is in a state of rest that it contains much starch in the roots."

Grey (1841) while passing north of the Hutt River notes that the local Aborigines utilised the roots of the Native Flag, and in his list of utilization of species by Aborigines notes that two species of *Typha* (page 292) were used. Grey would have been familiar with both species as he visited several Aboriginal groups around Perth, including at Lake Yellagonga before travelling north.

Eyre (1845) recorded a "Broad Leaved Flag" near Esperance on June 19, 1841.

Shenton (1934) in interviewing her mother-in-law noted that in

1829 she described the vegetation of the river edge of Mount Eliza.

" It also ran down to the river, a mass of beautiful flowers of every hue on trees, shrubs and small plants with banks of bracken and tall bullrushes at the river edge." This helps confirm that the plants collected by Preiss were present at the date of settlement.

The importance of *Typha* to Aboriginal people can also be gauged in the number of swamps that were named by the Noongars after the Bulrushes, including Yangebup, and Bendya Yangeetup (Blythes Swamp) at Bunbury. Some now apply to localities such as Yanchep, a name derived from Yanget (Bullrush). There are observations from early settlers that Aborigines burnt the *Typha* stands before harvesting (*Typha* dries off in winter) this and the subsequent harvesting of rhizomes would have slowed growth and build up of dead material. Heavy harvesting may have thinned stands helped keep the species in check in natural wetlands. Both species are reported to have increased in eastern Australia since European settlement. In Western Australia much natural habitat on the Swan Coastal Plain has been filled, drained or cleared.

There is ample evidence that *Typha* was a major food source for the Noongar people of Perth. Unfortunately Drummond never collected a specimen of *Typha*. Preiss's well labelled material is most useful, being well educated he was always trying to resolve and refine the chaos of superficial knowledge, carefully labelling each collection with locality and date as no one had done before in Western Australia. Drummond was a true bushman driven by a need to find novelties to sell to European botanists (Erickson 1969 and McGillivray 1975) rather than document that, which was to his mind already known. The only authentic early record of what *Typha* was present around Perth is the Preiss collection of *Typha orientalis*, and with his careful collecting it was probably the only species, or only common species.

STATUS OF *TYPHA* SPECIES IN WESTERN AUSTRALIA

Until the revision of Briggs and Johnson (1968) it was considered that a single species of *Typha* occurred in Western Australia. Previously Melvaine (1940) had indicated that at least two species were present in Australia,but this treatment does not seem to have been followed in Western Australia. *Typha* was considered a single species and native to Western Australia by Bentham (1878), Gardner (1930) and Beard (1965). The first record of *Typha orientalis* being listed as an introduced species was in Green (1981) where the two species were listed separately for the first time. This allocation has subsequently been followed by

nearly all West Australian publications and Australian weed guides (Florabase, 2014).

Typha orientalis was collected in Australia just after European settlement, in Western Australia only ten years after settlement, several years to decades before *Typha domingensis*. There are numerous references to the importance and use of *Typha* for the Noongar, including by Preiss on his collection of *Typha orientalis*.

We can find no evidence of why *Typha orientalis* became, or is currently considered introduced to Western Australia. No other Australian State lists *T. orientalis* as introduced. Briggs (1987) lists *Typha orientalis* as native throughout Australia in her treatment of the genus for the *Flora of Australia*.

From the available evidence, it appears likely that *Typha domingensis* was not native or common in the temperate areas of Western Australia, but was rather a species of more arid areas that has subsequently expanded into southern Western Australia. Both species should be considered as native Western Australian species, but it should be noted that both species have weedy tendencies including elsewhere in Australia.

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TWENTY-FIVE YEARS BURIED: REDISCOVERY OF THE BUNGLE BUNGLE ROBUST SLIDER, *LERISTA BUNGLEBUNGLE* (LACERTILIA: SPHENOMORPHIDAE)

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ABSTRACT

The fossorial skink, *Lerista bunglebungle* was previously only known from a single specimen collected in 1989 from Purnululu National Park, Western Australia. A restricted distribution and little documentation have resulted in a 'Priority Two' listing by the Department of Parks and Wildlife. To address a basic criteria requirement, targeted surveys were conducted in August and September 2014 resulting in the capture of a single animal. Photographs of this species in life are provided for the first time as well as documentation of body size, reproductive condition and habitat use. Although only a single individual was found, this new information provides the opportunity to comment on potential threats and make recommendations to conduct further surveys to assess the conservation status of this poorly known species.

INTRODUCTION

The genus *Lerista* is the second most diverse Australian skink group with currently 91 described species (Wilson and Swan 2013). In Western Australia, 16 of these are variously ranked as priority species mainly due to their very restricted distributions. One species of particular interest, the Bungle Bungle Robust Slider *Lerista bunglebungle*, is only known from a single specimen collected in 1989 during biodiversity surveys of the then newly declared Purnululu National Park in the Kimberley region (Gambold 1992). *Lerista bunglebungle* was described by Storr (1991) as a new member of the *L. macropisthopus* group with the following characteristics: snout-vent length 59 mm with a moderately robust body, 2 fingers and 3 toes, moveable eyelids and a pale brown body with 6 lines of dark brown dots and a dark upper lateral stripe (Figure 1). This description by Storr and notes in Gambold (1992) comprise the only sources of available information on this species. Importantly, specific capture details of this unique specimen found in Cathedral Gorge include 'it was raked from

soil beneath old-growth *Plectrachne* growing on a deep bank of sand pushed up against the sandstone wall' (N. Gambold pers. comm.). Despite several unsuccessful searches for *L. bunglebungle* by herpetologists, it has remained one of two *Lerista* species in Australia not seen and photographed since their discovery. The other species is *L. quadrivincula* (Shea 1991), also from Western Australia.

Currently, *L. bunglebungle* is listed as a data deficient 'Priority Two' species in Western Australia which states: "Taxa with few, poorly known populations on conservation lands. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna" (Department of Parks and Wildlife 2014). To address this criterion, targeted surveys were undertaken for *L. bunglebungle* during August and September 2014.

METHODS

Targeted daylight surveys for *L. bunglebungle* were conducted from 11–13 August and 22–25 September 2014, employing the following survey methods:

- Trapping using pitfall buckets, funnel traps and drift fence; and
- Hand-foraging by lifting and raking beneath groundcover (e.g. logs, rocks, coarse woody material) and raking leaf litter and soil beneath trees, shrubs and spinifex.

Seven pit-trap lines were established, spaced along the entire length of Cathedral Gorge, comprising a total of 20 x 15lt plastic buckets and 12 funnel traps opened for three consecutive nights. Each trapping locality was limited to areas combining the following: sufficient sand to install a 15 litre plastic bucket and suitable micro-habitat of unburnt leaf litter, soil debris and vegetation cover. Hand-foraging sites were concentrated along Cathedral Gorge and several other smaller gorges and associated ledges and fissures of the Piccaninny Massif in the vicinity of Cathedral Gorge and along Piccaninny Creek.

RESULTS

Hand-foraging was successful, with a single, adult female *L. bunglebungle* (Figure 1) captured on the 24th September, raked from beneath deep leaf-litter and rubble at the base of a large Eucalypt (*Eucalyptus aspera*) on a sheltered ledge high above Piccaninny Creek (17°28'52"S, 128°22'49"E). The snout-vent length of the specimen measured 67 mm, possessing an original tail with a regenerated tail-tip (63 mm). The capture site was one of the few areas along the western edge of Piccaninny Creek protected from a large, recent fire (Figure 2). The close proximity of the site to the creek bank had effectively created an 'island'

Figure 1. *Lerista bunglebungle* in life and the key characters of this species: (A) movable eyelid and lateral view of head scalation (B) dorsal view of head scalation (C) fore limbs with 2 fingers and lateral pattern (D) hind limbs with 3 toes and (E) dorsal view of colour and pattern.

Figure 2. Habitat and capture site of *L. bunglebungle*. A small, unburnt patch of vegetation with *Eucalyptus aspera*, *Ficus* sp. and numerous low shrubs over dense *Triodia* sp.

Figure 3. Recently burnt habitat close to where *L. bunglebungle* was found along Piccaninny Creek.

from the remaining, semi-contiguous burnt habitat (Figure 3). The descriptive characteristics provided by Storr (1991) and Wilson and Swan (2013) allowed for a positive identification which are illustrated in Figures 1A–E. The only other similar-sized *Lerista* species it may be confused with in the area is *Lerista borealis*, which has no lateral stripe (Wilson and Swan 2013). The specimen was subsequently photographed and

released at the capture site. A tail-tip was also taken as a genetic voucher for the first time (Western Australian Museum tissue collection number TR1338).

DISCUSSION

The successful capture of a second specimen of *L. bunglebungle* after a 25 year gap provides some important information on occurrence, biology and habitat as follows:

- Evidence that a population persists in the area, in particular, this specimen possessing two semi-developed egg follicles provides basic information on reproductive biology.
- Additional measurements on the species, particularly the previous recorded maximum snout-vent length of 59 mm (Storr 1991) now increased to 67 mm.
- Live photographs, including those outlining distinguishing characters (Figures 1A–E) which can be used as a tool to aid in future identifications for park managers, researchers and interpretive programs for the park.
- A tail-tip taken for future genetic studies.
- An additional location and observations of habitat and micro-habitat use and how these potentially relate to perceived threats such as fire.

With few records of *L. bunglebungle*, it is difficult to comment on population size and trends. However, there are several potential threatening processes which may influence the occurrence and distribution of the species in Purnululu National Park. Introduced species such as the feral cat may constitute a serious threat, particularly in areas of recent fires where cat activity in the Kimberley region is known to be very high (McGregor *et al.* 2014). In addition, the recent invasion and predatory role of the Cane Toad (*Rhinella marina*) into the area could have implications. In particular, the specific habitat which *L. bunglebungle* may rely on has been naturally protected from the aridification of the surrounding environment; leading to toads congregating in these areas.

Frequent and intense fire is likely to be the most serious threat based on observations made during the 2014 targeted survey. Although only a single specimen of *L. bunglebungle* was found in an unburnt area (Figure 2), the dominance of the relatively dense, old-growth spinifex (*Triodia* sp.) is potentially significant. This vegetation understorey combined with groundcover (e.g. leaf litter, logs and rocks) provides important shelter from heat, predation and food supplies for a variety of species. For example, the 'phasmid' geckos *Strophurus* spp. are totally spinifex dependent (Wilson and Swan 2013). One

species, the Kimberley endemic *S. robinsoni* occurs in the same area as *L. bunglebungle* (R. Lloyd pers. obs.), and similarly to other *Strophurus* spp. (i.e. *S. horneri*, see Oliver and Parkin 2014), may also be affected by fire. By comparison, much of the immediate area had been intensively burnt, particularly in the vicinity of Piccaninny Creek and less sheltered gorges and smaller outliers of the massif (Figure 3). The spinifex was seriously depleted, with noticeably poor quality leaf litter and soil to provide adequate shelter for a medium to large-sized fossorial skink. Other members of the *L. macropisthopus* group (e.g. *L. macropisthopus* and *L. neander*) are also reliant on deep leaf litter and soft soil layers with high moisture content (R. Lloyd pers. obs.). In addition, major disturbances such as fire may also deplete the food resources of macro-invertebrates, including termites for small lizards and poor dispersal abilities may also make it more susceptible to fire.

The Piccaninny Massif is a very complex, and in many ways inaccessible area to conduct detailed field surveys. Based on the two known specimens, *L. bunglebungle* appears to occur in relictual pockets of dense vegetation associated with deep, sheltered gorges and protected sites around the massif. It is highly likely the distribution of the species will include similar habitats throughout the area, including the massif summit where suitable habitat also exists (N. Gambold pers. comm.). Targeted surveys have proven to further quantify and understand the core habitat requirements, general ecology and highlight potential threatening processes, particularly for species that are poorly known and have remained unseen for many decades (e.g. *Lerista allanae*, see Borsboom *et al.* 2010; *Tiliqua adelaidensis*, see Armstrong *et al.* 1993). It is recommended that *L. bunglebungle* and other rare reptile species (e.g. *Ctenotus vagus*: Horner 2009) unseen for many years in the Purnululu National Park, be prioritised in future management plans to include targeted survey efforts.

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INTERESTING NATURAL HISTORY OBSERVATIONS MADE BY A SHIP-WRECKED SAILOR ON THE NORWEST CAPE IN 1875–76

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INTRODUCTION

This article draws together some observations on the natural history of the North West Cape made by a shipwrecked sailor as recounted by Rathe (1990). At 2.30 am on 27 October 1875, the barque Stefano was wrecked off Point Cloates on the west side of the North West Cape. The Stefano, built in Rijeka, (now in Croatia), was on her maiden voyage from her home port to Cardiff (Wales) and then Hong Kong with 1300 tons of Welsh coal. At 26, the captain was the eldest of the 16 Croatian crew members. The English cabin boy, aged 12, was the youngest and the only non-Croatian. After hitting rocks, most of the crew made it to shore where they lived on stores washed in from the wreck, berries, fish, clams and crustaceans. Using the lens from a sextant, they made fire and, using a fragment of a salvaged map, they decided the mouth of the Gascoyne River offered the best hope of being rescued, so headed south. Despite occasional encounters with Aboriginal people, who took them to water and gave them food, all but two had died by mid January.

The two survivors, Michael Baccich aged 16 and Ivan Jurich, also in his teens, were themselves near death when a group of Aboriginal people adopted them, nurtured them back to health and escorted them towards a point on the shore of Exmouth Gulf where there had been regular contact between Aboriginal people and a pearling captain, Charles Tuckey. The account of their survival in harsh, arid conditions and their eventual rescue by Tuckey on April 17 1876 is, in itself, fascinating but, as Lesley Marchant states in the foreword to Gustave Rathe's book, the story provides "*An account of the Ningaloo area in its pristine state as seen through the eyes of two young Croatian boys*".

In the book, Rathe (1990) gives a comprehensive account of the boys' adventure. Its provenance and authenticity are best shown by quoting directly from the author's introduction. "*This book is an adaptation of the account of the adventure recorded by Stjepan Skurla, S.J., who had many conversations with the two young survivors in 1876, a year after the wreck but only a few months following the rescue. I have added*

information obtained in interviews with Baccich's family and with the descendants of Captain Charles Tuckey, the rescuer. I visited Australia, located the site of the wreck using a map drawn by Baccich and gathered more information as I retraced most of the journey of the young castaways." Rathe tells the story from Baccich's perspective using the first person.

OBSERVATIONS

Food. Besides items they had salvaged from the wreck, and prior to two of them being adopted by groups of Aboriginal benefactors, the survivors mostly foraged for 'berries' close to the shore and for items like crabs, 'clams' and fish that could be acquired from the sea. Their inland forays for 'berries' increased after Aboriginal people showed them a well where they could obtain water but their diet seemed to have been meagre and with little variety except when Aboriginal people gave them food.

However, the diets of the last two survivors, Baccich and Jurich improved greatly after they were taken in by a group of Aboriginal people. It seems that neither the Croatians nor the Aboriginal people, at least while the Croatian boys were with them, ever ventured into the limestone uplands of Cape Range. Instead, they stuck to the coastal plains where there were well-trodden paths and where women foraged for berries and seed from which they made damper while men obtained food from the ocean. Crabs and other crustaceans, shell fish and fish were staples but, when ever possible, turtles and turtle eggs were taken. On one occasion a dugong was captured; it fed them for several days. The brief description of the way in which it was taken suggests they used a method similar to that employed by Aboriginal people on the Pilbara coast (Durlacher 2013).

Land animals are seldom mentioned: On one occasion, the women smoked masses of termites from their mounds. Reptiles (besides turtles) are mentioned only once when, on a notable occasion, they feasted on two rays, four snakes and a fat lizard. Interestingly, we learn that the Aboriginals also kept snakes for pets because Baccich checked that two pet snakes kept by his hosts were still "*accounted for*" before he would eat any of the snake meat. Terrestrial mammals are mentioned only once when someone killed a dog and brought it back to camp. Though the Croatian boys were hungry for red meat they were the only people in the group who were not allowed to partake because their Aboriginal companions knew that white people didn't eat dog! Ironically, when a baby died and its body was eaten in a ritual ceremony, the Croatians were required to participate.

On one occasion, after rounding the Cape, the Aboriginal people

launched a sail boat they'd previously obtained from European sailors and sailed rather erratically to Muiron Island just off the northern tip of North West Cape. The Croatian boys were taken along. That night they "*had a light supper of turtle eggs and retired early.*" The next morning the Croatians and one man (he was crippled) were told to stay and tend the fire while "*the others went after pigeons, pigeon eggs and, of course, turtles. Early in the day the hunters returned loaded down with an amazing quantity and variety of birds as well as lots of fish, turtles and eggs.*" (Baccich gave a detailed description of the 'pigeons'. *They were quite beautiful, their heads crested by large tufts of jet-black feathers and the wings striped black and gold with white at the very edge.* Crested Pigeons are the only pigeons that have such crests but they are not known from the island. Moreover, they need fresh water, which is not available there except for a short time after rain. Ron Johnstone suggests they could have been Crested Terns "as they have a large jet black crest, their wings have the black zone edged with white and the shafts can be yellowish". However, there are no breeding records from the island (Ron Johnstone, in lit. to the editor). None of the other birds were identified.

The account continues with the observation that "*Apparently the remoteness of the island and the rare appearance of the natives made the game easy prey. It was the sail boat which had abruptly changed all this, and I wondered how soon Muiron Island would be like the mainland where the natives had to work so hard to catch or gather food.*" (They were rescued a few days later and Baccich presumably learned the name of the island from Captain Tuckey or his charts.) Baccich makes an interesting observation after that trip. So much food had been gathered that "*in no time at all, it* (the boat) *was loaded beyond what was sensible —. This was the first time I saw any waste; fifteen turtles and some eggs and birds had to be left on the beach.*" This upset Baccich because, on the mainland "*not a single morsel of food had ever been gathered in excess*" and he "*realized the introduction of the sailboat — had brought with it some new evil.*"

Fire. Aboriginal people routinely used fire for cooking and, from time to time, they lit 'bonfires' to signal other people. For instance, one was lit by the people who spotted the dugong to call in other members of their group, who were travelling a different route. Another was lit by the hunters on Muiron Island to let their comrades on the mainland know they were returning. On one occasion, a 'bonfire' was lit in an attempt to attract the attention of a distant ship but it sailed on into the Indian Ocean. However, besides cooking and signal fires, there is no other mention of fire nor any mention of burnt country.

Boats. Besides regular contact with Captain Tuckey, there was evidence that the Aboriginal people of the Cape had made contact with foreigners or, at least, foreign people had approached the coast. The boat used to access Muiron Island has been mentioned. Before that, the Aboriginal guides had led the boys to a dinghy on the west coast. Disappointingly, it was damaged beyond repair. However, to me the most interesting boats were a pair of canoes that the Aboriginal people had previously stowed behind the beach. They "*had been hollowed out of some light, tropical log and had carving at the bow. There was some bamboo trim and there was a partial shelter or decking*" They were light enough that two men were able to carry them down to the sea and launch them. The Aboriginal people were adept at paddling them and used them to capture and bring ashore "*two huge turtles*" but the Croatians couldn't handle them without capsizing.

DISCUSSION

There is disappointingly little information on the flora or vegetation and, although the obviously-Asian canoes pose interesting questions, little more can be said about them. However, what is **not** said about the terrestrial vertebrate fauna and fire is interesting and warrants some discussion. First, however, it is worth recalling that two Croatian teenagers who had never before left Europe made the observations recounted by Baccich and recorded by Stjepan Skurla in 1876. One can understand why they make little comment on animals like crabs, fish and seabirds, and even turtles, all of which would have been familiar. (Four species of turtle occur in the Mediterranean and two of them breed there (www.euroturtle.org/distrib.htm; accessed 9/11/2013). The dugong elicits a little more interest and the 'Crested Pigeons' seen on Muiron Island are described in considerable detail although none of the other species among the "*amazing — variety of birds*" are described.

However, it seems unlikely that Croatian boys would have been so familiar with kangaroos and emus, both of which are common on the coastal plains today, that they would have ignored them. Yet there is no mention of any being seeing or of Aboriginal hunters taking them, despite the way they relished the red meat of a dingo and a dugong. Indeed, the dingo was the only land mammal record as being eaten. Were animals like kangaroos and emus really rare at the time? Kangaroos, in particular, are abundant along the west coast in Cape Range National Park today.

Although the Croatian boys would have been familiar with forest fires, which are common in Croatia (Mahović, 2010, reported 464 fires that burnt >1ha in Croatia in 2009), the lack

of any mention of bush fires on the North West Cape is puzzling. The Aboriginal people were adept at lighting fires. Indeed, they lit fires almost daily for cooking and (probably less frequently) for signalling. However, there is no mention in the account of people lighting more extensive fires, no mention of smoke from bush fires and there is no mention of travelling through burnt country.

ACKNOWLEDGEMENTS

I thank Bob Prince for drawing my attention to Durlacher's account of the methods used to capture dugong on the Pilbara coast and to John Dell for useful comments on the manuscript and for passing on to me Ron Johnstone's comments on the identity of 'pigeons' on Muiron Island.

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CONTACT CALLS OF BAUDIN'S COCKATOO *CALYPTORHYNCHUS BAUDINII*

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ABSTRACT

Two species of white-tailed black cockatoo, Baudin's Cockatoo (*Calyptorhynchus baudinii)* and Carnaby's Cockatoo (*Calyptorhynchus latirostris*) are endemic to the south-west corner of Western Australia. They are difficult to identify in the field even by experienced observers. Both were only recognised as full species in 1979, but some recent molecular work suggests combining these as a single biological species. Bill size and shape and the calls are the most reliable means of identification. Baudin's Cockatoo has a much shorter contact call compared to Carnaby's Cockatoo. In this paper we provide details that there are distinct differences between the male and female contact calls of Baudin's Cockatoo and this highlights the importance of vocalisations in establishing limits of species among forms that are not well differentiated morphologically.

INTRODUCTION

The two species of white-tailed black cockatoo – Baudin's Cockatoo (*Calyptorhynchus baudinii*) and Carnaby's Cockatoo (*Calyptorhynchus latirostris*) – occurring in the south-west of Western Australia are extremely similar in morphology differing mainly in bill size and shape and in calls. Baudin's Cockatoo has the bill or culmen more laterally compressed than in Carnaby's with the upper mandible significantly longer and finer, with tip tapering well beyond the lower mandible when closed. Baudin's Cockatoo also has a much shorter "whicha-whicha" contact call compared to the longer "wee-loo wee-loo" or drawn out "wy-lah" call of Carnaby's (Johnstone and Kirkby 2008).

Saunders (1979) compared the "wy-lah" calls of Baudin's and Carnaby's Cockatoos and noted that they differed mainly in the shorter duration of the third segment of the call in Baudin's compared to Carnaby's. Saunders also noted that an experienced listener can identify the species on the call. This is certainly the case and both of us who have been studying these cockatoos for many years can identify them easily on calls. Judging from the

literature almost nothing is known about the voice of Baudin's Cockatoo and Higgins (1999) for example notes that there are no detailed studies.

RESULTS AND DISCUSSION

Over the past 15 years we have been carrying out extensive fieldwork throughout the south-west corner of Western Australia studying the breeding biology of Baudin's Cockatoo and from this work some interesting details of their contact calls have emerged, as outlined below. Throughout the range of this species an extensive series of recordings has been taken, including details of the sex of the bird making the call, the locality and date . Thanks to a growing body of new information from the field, we now have the opportunity to consider vocalisations, behaviour and ecology, together with morphology and patterns of distribution and migration (Johnstone and Kirkby 2008) in assessing the taxonomic status of Baudin's Cockatoo.

On the basis of available evidence, we assume that vocalisations are innate and that all vocal characters have a role in maintenance of species integrity in these cockatoos. Call notes with cockatoos serve a multitude of purposes including maintaining the pair bond, keeping the pair or family in touch and no doubt co-ordinating the movement of the flock. Baudin's Cockatoo has a range of calls including croaking, harsh aggressive sounds and also a song comprising a short whistle made during breeding displays. This paper deals only with the contact

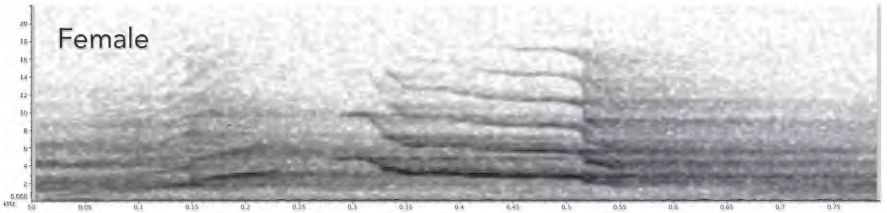

Figure 1. Sound spectrogram of contact call of female Baudin's Cockatoo from Margaret River.

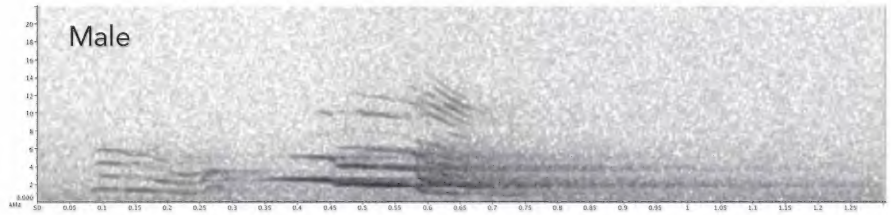

Figure 2. Sound spectrogram of contact call of male Baudin's Cockatoo from Mount Frankland National Park.

calls and a more detailed description of other vocalisations will be given in a later paper.

Noteworthy in our study is the fact that we have noticed differences in the male and female contact calls (Figures 1 and 2). The main contact call of females is a whippy or clipped type of call including the typical "whicher-whicher", "itcher-itcher" or "bunyip-bunyip", sometimes sounding more like "wudchi-wudchi", but overall short and sharp calls. On the other hand the male call is a much more drawn out "kurweeeurr". These calls are often given as duets (Figure 3) with male following female or vice versa and are constant throughout the range of the species (based on 141 recordings of 88 females and 50 males). This number also included one female that made the "kurweeeurr" call on one occasion and a single male that made both calls . Also one female breeding at Mount Solus was recorded making the "whicher-whicher" call one or more times on 18 separate visits to the nest and the male answered her with the "kurweeeurr" call on six occasions, but he was sighted only once. We have also noticed some regional dialects with females in Wungong Catchment for example (the most northern breeding population for Baudin's Cockatoo) making a much higher pitched call, but still clearly the typical short "wudchi" type call.

This is in stark contrast to the contact calls of Carnaby's Cockatoo (Figure 4) where both male and female contact calls are identical and extremely different from those of Baudin's

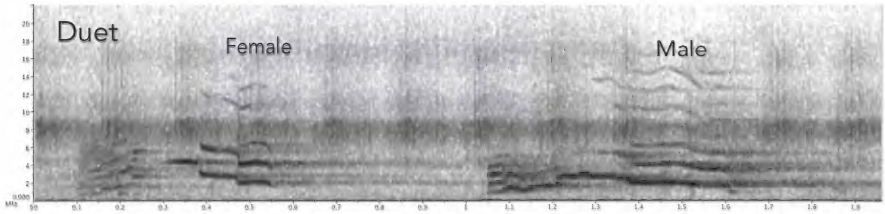

Figure 3. Sound spectrograms of duet of female and male Baudin's Cockatoos at Margaret River.

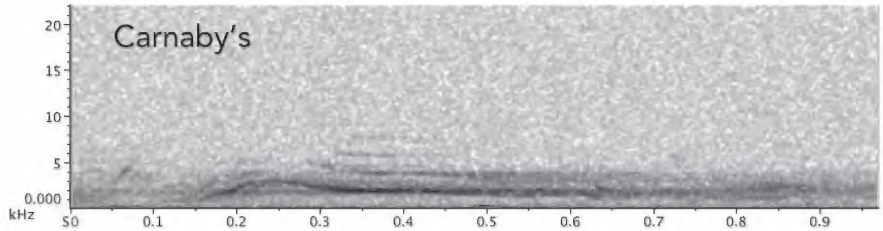

Figure 4. Sound spectrogram of contact call of Carnaby's Cockatoo from Hatter Hill near Lake King.

Cockatoo (based on over 150 recorded calls). Carnaby's contact calls are strikingly similar in rhythm, frequency, structure of individual notes and tone, and in other words sound very much alike. We have also been unable to elicit any response to playback of Baudin's calls from Carnaby's Cockatoos nor any response from Carnaby's of playback of Baudin's Cockatoo calls.

CONCLUSIONS

On the basis of recent molecular studies, it has been suggested that Baudin's and Carnaby's Cockatoos be combined as a single species (White 2011, and White *et al.* 2014). However, judging from our work, Baudin's Cockatoo *Calyptorhynchus baudinii* and Carnaby's Cockatoo *Calyptorhynchus latirostris* are unambiguously separate species based on morphology (mainly differences in bill, skull and wing), vocalisations (they do not respond to each other's calls), different behaviour and ecology, very different migrations and movements and no indication of hybridisation in the wild (despite nesting very close together in some localities) (Johnstone and Storr 1998; Johnstone and Kirkby 2008 and Johnstone *et al.* 2014).

This conclusion has important implications for the future conservation and management of these cockatoos. Baudin's Cockatoo has declined greatly in the past 50 years and its low rate of reproduction precludes it from replacing large numbers lost through illegal shooting and other causes including habitat destruction and wildfires. In the past ten years there has been an apparent decline in the number of Baudin's Cockatoos returning to traditional roost sites in their northern wintering quarters in the Darling Range. Judging from these surveys, Baudin's Cockatoo is now the most endangered black cockatoo in the south-west of Western Australia and its future conservation is currently of great concern. Because of this, both Baudin's and Carnaby's Cockatoos must be managed as separate entities that have different ecologies and behaviour not as a single uniform species.

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FROM PERTH TO ROTTNEST AND BACK AGAIN: SILVEREYE MOVEMENTS ACROSS OPEN WATER

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The western subspecies of Silvereye *Zosterops lateralis chloronotus*, which occurs in western South Australia and south-western W.A. (Higgins *et al.* 2006) is a small passerine with mean length and weight for males of 12cm and 11g, and for the slightly smaller females of 11.5mm and 9g (Johnstone and Storr, 2004). It is common in a wide range of habitats including coastal heath, scrub, woodland and forest in a south-west range roughly bordered by a line from Carnarvon through Kalgoorlie to Eucla (Johnstone and Storr, 2004). As a species, Silvereyes are described as sedentary, resident or part-migratory and sometimes nomadic (Higgins, Peter and Cowling, 2006). Banding studies conducted on the east coast of Australia confirmed that a portion of the Tasmanian race *Zosterops lateralis lateralis*, crosses Bass Straight to winter in mainland Australia (Chan and Kikkawa 1997, Rooke 1984). Saunders and de Rebeira (1993) suggest that the Rottnest Island population of Silvereyes in south-western WA may not be isolated from the mainland population and this has now been confirmed by banding records.

The south west Western Australian population is usually considered resident, with short-range movements including autumn-winter movement from the coast to the semi-arid interior portion of its range (Higgins *et al*2006, Rooke 1984). Long distant movements of banded birds include a bird banded in the Perth suburb of Nollamara in April being recovered 254 km S at Witchcliffe in May of the next year, a bird banded at the Perth suburb of Wembley in June being recovered 151 km S at Allanson in April the following year, and a bird banded at Margaret River in April being recaptured 110 km ESE at Manjimup in April the following year (Rooke 1984).

Recapture of banded birds through the Australian Bird and Bat Banding Scheme (ABBBS) has now shown that sub species *Zosterops lateralis chloronotus* also moves across open water between Rottnest Island and Perth. An adult Silvereye that was banded at Herdsman Lake in the western suburb of Wembley (Latitude -31.9, Longitude 115.79)

in April 2009 was recaptured on Rottnest Island in May 2012, three years and one month later and 28km W of the original banding site. In February 2013, an adult Silvereye, one of 200 banded by us in a single morning on Rottnest, was recaptured two months later at our Bold Park bird banding site in the western suburb of Mt Claremont.

Both these records coincide with Rottnest Island being re-established in May 2012 as a cooperative banding station in addition to long-term, intensive banding being conducted at Herdsman Lake and Bold Park on the adjacent mainland. In the 18 months to November 2013 since that time, 311 Silvereyes have been banded at Rottnest Island, 743 at Herdsman Lake and 889 at Bold Park. With two movements recorded from such a relatively low number of birds captured at Rottnest Island, we suggest that travel of Silvereyes to and from the Island is not unusual and predict that further study may reveal regular movements.

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HERE TODAY, GONE TOMORROW: A MISTLETOE SAGA

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On 29 June 2013, two of us (JDS and MJS) collected a mistletoe from a Woollybutt (*Eucalyptus miniata*, Myrtaceae) growing just west of the King Edward River crossing on the track to the Mitchell Plateau, Northern Kimberley. It was identified by ANS as *Diplatia furcata* Barlow (Loranthaceae) and deposited in the Western Australian Herbarium (PERTH 08509514). The species is known from several locations in the Top End of the Northern Territory and, disjunctly, from the east coast of Queensland (Australia's Virtual Herbarium) but it had not previously been recorded from Western Australia (WA), where the Kimberley mistletoe flora has recently been documented by Start (2013).

Because *D. furcata* occurred in other Australian States, where it was not threatened, it did not qualify for listing under IUCN threatened categories but because, in WA, it was known from a single plant growing in a fire-prone habitat, it was listed as a State Priority 3 species. Most mistletoes are killed by fire if they are extensively scorched. Only fresh mistletoe seed germinates and establishment of new plants requires that the seed is deposited on a suitably-sized twig of an acceptable host (Start 2011, 2013). Thus, fire, particularly hot fire that burns extensive areas and scorches tree canopies, threatens entire mistletoe populations.

In 2014, JDS and MJS returned to the site where they had collected *D. furcata*. The area had burnt since their previous visit and the only-known plant was dead. They spent some hours searching adjacent areas for more plants but to no avail. Has this species disappeared from WA just one year after it was discovered here? Only time and careful observation will tell but, given the huge areas that are frequently burnt by hot fires in the Kimberley, the prognosis is not good.

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Owlet-nightjar in urban Perth – During a walk on 30 January 2015 just on dark about a block and a half from my home in Scarborough my son spotted an owl type bird on the Ventnor St. street sign on the corner of Ventnor and Colin roads opposite the Colin Ventnor Reserve. The bird was visible under the street light. We peered up beneath it, trying to identify it while the bird stayed put, it let out a loud high pitched "prrr". I answered and quite a conversation ensued. We then heard another one calling which we found on the other side of the road. We spent 3 to 5 minutes communicating before returning home. While my son was identifying the bird from my bird book as an Owlet-nightjar a "prrr" came from my back yard and there sitting on my fence were the two birds. They had followed us home.

I managed to get a poor quality photograph of one of the birds on my hardiflex fence. John Dell confirmed the identification as an Owlet-nightjar (*Aegotheles cristatus*).

About a week later on 9 February in the dark I crossed from my complex in Ventnor St. to Butlers Reserve and after calling "prrr" I got an answer. The two Owlet Nightjars flew to a tree branch nearby but when I raised my camera they took off however I was able to call them back again, although this time they wouldn't follow me home.

Owlet-nightjars are infrequently recorded on the Swan Coastal Plain and less so in urban areas like where my observations were made. Being nocturnal they are difficult to survey and their status in the metropolitan area is still largely unknown. Undoubtedly being an obligate user of tree hollows for both roosting and breeding, they would have declined with clearing of the eucalypt woodlands on the Coastal Plain. Whether they are resident or seasonal remains conjecture. Alexander (1921, The Birds of the Swan River district *Emu* 20: 149-168)stated "This little nocturnal bird is probably resident, but may be only a visitor. It would seem to be very uncommon in the district". Serventy (1948, Birds of the Swan River District, *Emu* 47: 241–286) repeated Alexander's observation and concluded that "There has been no later information". Storr and Johnstone (1988, Birds of the Swan Coastal Plain, *Records of the Western Australian Museum* Supplement no. 28, p.54) considered that its status was uncertain as there were no records between May and September, thus implying that they thought it was probably migratory. Any observations would help in understanding the status of this declining species.

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CLUB NEWS

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General Meetings and Branch Meetings are held at various venues in Nedlands, Kalamunda, Rockingham and North Beach.
The Retired and Leisured Group meets on alternate Wednesdays at 10a.m.
Excursions and field days are planned from time to time and will be advertised in the Club's monthly newsletter "The Naturalist News".

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